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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/633,500	08/05/2003	Shye-Lin Wu	BHT-3167-149	5214

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BRUCE H. TROXELL  
SUITE 1404  
5205 LEESBURG PIKE  
FALLS CHURCH, VA 22041

EXAMINER

ROCCHEGIANI, RENZO

ART UNIT PAPER NUMBER

2825

DATE MAILED: 06/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/633,500

Applicant(s)

WU, SHYE-LIN

Examiner

Renzo N. Rocchegiani

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) 1-6 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 7-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election without traverse of claims 7-12 in the reply filed on April 12, 2004 is acknowledged.

### ***Claim Objections***

2. Claim 7 is objected to because of the following informalities: this claims ends with a semicolon, this is improper punctuation, the claim should end with a period. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 7 and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,621,107 B2 (Blanchard et al.).

Blanchard et al. disclose a device comprising power rectifiers wherein the device comprises a first conductivity type substrate (item 200) with a first conductivity type epitaxial layer (item 202) formed on the substrate, the first conductivity type epitaxial layer is only lightly doped (col. 5, lines 25-30), a cathode metal layer over the side of the substrate opposite from the side where the epitaxial layer is formed (col. 6, lines 50-56), a first oxide layer on the surface of the epitaxial layer (item 210), a plurality of trenches formed in the epitaxial

Art Unit: 2825

layer (items 219a-c), the trenches spaced apart by mesa region (col. 5, lines 50-58), cell trenches (item 219b), a second conductivity type region formed in the mesa region in the epitaxial layer (item 204 and col. 5, lines 30-35), a Schottky barrier silicide layer such as platinum silicide (col. 6, lines 38-43) formed in the trench and a top metal layer such as TiW/Al that acts as an anode (col. 6, lines 38-43), said top metal layer comprising a silicide region and over all surfaces of the mesa regions. (Fig. 6F)

While Blanchard et al. do not specify the order in which the metal layers for the anode are deposited, Blanchard et al. disclose that the silicide would be positioned at the bottom. (col. 8, lines 25-35).

It would have been obvious to one with ordinary skill in the specific art to position the silicide at the bottom, since Blanchard et al. disclose that such a set up is the preferred set up and thus one with ordinary skill in the art would be motivated to form the silicide at the bottom and have an expectation of success.

5. Claims 7 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,686,614 B2 (Tihanyi).

Tihanyi discloses a device comprising power rectifiers wherein the device comprises a first conductivity type substrate (item 24) with a first conductivity type epitaxial layer (item 22) formed on the substrate, the first conductivity type epitaxial layer is only lightly doped (col. 4, lines 8-13), a cathode metal layer over the side of the substrate opposite from the side where the epitaxial layer is formed (item 104), a first oxide layer on the surface of the epitaxial layer (item 70), a cell trench formed in the epitaxial layer (item 85), a

Art Unit: 2825

second conductivity type region formed on the region around the trench in the epitaxial layer (item 30), a Schottky barrier silicide layer such as platinum silicide (item 50 and col. 4, lines 41-48) formed in the trench and a top metal layer that acts as an anode (item 60), said top metal layer being formed over the silicide region and over all surfaces of the device. (Fig. 2)

Tihanyi does not specifically disclose that a plurality of trenches are formed in the epitaxial layer and that the trenches are spaced apart by mesa regions.

It would have been obvious to one with ordinary skill in the specific art to form a plurality of trenches thereby forming mesa regions, since Tihanyi discloses that a plurality of MOSFET structures are formed on a substrate (col. 1, lines 7-42), because it is well known in the art to form a plurality of devices on the same substrate and because it has been held that mere duplication of working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8.

6. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,686,614 B2 (Tihanyi) in view of US Patent Publication No. 2003/0151086 A1 (Ueno et al.).

As stated in paragraph 6, all the limitations of these claims have been met except for teaching that the insulation layer formed over the epitaxial layer comprises a nitride and an oxide layer of specified thicknesses and the size of the trench.

Art Unit: 2825

Ueno et al. teaches the formation of a MISFET wherein the insulating layer of the MISFET comprises an oxide layer and a nitride layer. (items 4a-c).

It would have been obvious to one with ordinary skill in the specific art to combine the teachings of Ueno et al. to those of Tihanyi and form an oxide and a nitride layer for the insulating layer, since Tihanyi discloses the formation of a MOSFET with a diode and Ueno et al. teach how to achieve a current-voltage characteristic close to that of an ideal diode. ([0013]) Furthermore, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Finally, while the prior art does not disclose or teach the claimed size of the dielectric layer and of the trench, such limitation would be obvious to one with ordinary skill in the specific art, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Furthermore, it has also been held that a change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237.

### **Conclusion**

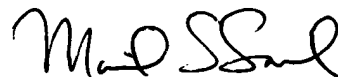
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Renzo N. Rocchegiani whose telephone number is (571)272-1904. The examiner can normally be reached on Mon.-Fri. 8:00 am - 5 pm.

Art Unit: 2825

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571)272-1907. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Renzo N. Rocchegiani  
Examiner  
Art Unit 2825

A handwritten signature in black ink, appearing to read 'M. Smith'.

MATTHEW SMITH  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800